

XLI.—On the Dentition of Rhinoceroses (Rhinocerotæ), and on the Characters afforded by their Skulls. By Dr. J. E. GRAY, F.R.S. &c.

[Plate XI.]

IN the 'Proceedings of the Zoological Society' for 1867, and in the 'Catalogue of Carnivorous and Pachydermatous Mammalia in the British Museum,' p. 295, I gave an account of the skulls of the Rhinoceroses in the British Museum, and described their dentition in the young and in the adult animals. Since that period the British Museum has received several additional specimens, which have enabled me to observe further details of the changes that take place in the skulls and teeth during their growth; and I have been induced to condense in this paper the results of their examination.

The Asiatic Rhinoceroses have the front of the nasal bone convex, produced, and more or less acute in front.

The intermaxillaries in the skull of the very young animal are spongy and united together in front, with two rudimentary teeth on the hinder part of each side. In the older animals these teeth are more elongate, produced, and separate from each other in front, and supported by a more or less long process of the intermaxillary bone, which encases the upper and outer side of their hinder part. The young animals have two teeth on each side, the hinder being the smallest; but in the older animals both these teeth drop out, and the front one is replaced by a large tooth, which eventually has a large flattened crown.

In the Asiatic one-horned Rhinoceroses (*Rhinoceros*) there is a small cylindrical cutting-tooth on the inner side of the

they can be divided into five principal groups, in which *all* sponges, including the *Hexactinellidæ* and *Calcispongiæ*, may be included, thus:—

1st. Sponges with horny fibre and granular axis without foreign objects. *Aplysiniidæ*.

2nd. Sponges with horny fibre, amorphous sarcode, and axis of foreign objects. *Herciniadæ*.

3rd. Sponges with horny fibre and axis of proper spicules only, *i. e.* spicules formed by the species. *Chalinidæ*.

4th. Sponges with horny fibre and axis of proper spicules, more or less echinated also with proper spicules. *Armataæ*.

5th. Sponges in which the fibre is formed of proper spicules cemented together by amorphous sarcode. *Renierinæ*.

It should always be remembered that the materials of the axis cannot get into the fibre after the latter is formed, and therefore that the sponge must arrange all this beforehand.

In a short time I hope to go further into this subject, as I have completed the 1st and 2nd divisions so far as subgrouping goes.

two large lateral ones. These teeth are close to the inner side of the lateral ones in the skull of the foetal animal; but they become separated from them as the front of the jaw dilates for the secretion of the permanent cutting-teeth, and when the larger lateral cutting-teeth are developed they are more compressed together. They are generally present; but there is a skull of *Rhinoceros javanicus* in the Museum (723a) in which they are deficient, the inner sides of the large lateral cutting-teeth being very close together.

In the lower jaw of the skulls of very young animals there is a large conical cutting-tooth on each side in front. This tooth is very depressed, and has sharp edges on the sides, and a half-ovate end. It becomes worn down, and is replaced by a larger tooth, which becomes worn down on the upper surface so as to produce an elongated flat disk with an acute front.

In the skulls of the adult two-horned Asiatic *Rhinoceroses* (*Ceratorhinus*), these two middle cutting-teeth are wanting. I have never seen a very young skull of these animals.

Ceratorhinus sumatranus.

The figure of the skull, like the figure of the animal, attached to Mr. Bell's paper in the 'Philosophical Transactions' (vol. lxxxiii. 1793, p. 3, t. ii.-iv.) well represents this species, and has well-developed cutting-teeth in the lower jaw, and the space between the condyles of the skull narrow, which is the character of this species.

Home's figure of the skeleton of the Sumatran *Rhinoceros* (Phil. Trans. 1821, t. xxii.), from the skeleton now in the Royal College of Surgeons, better represents the height of the skull, but scarcely sufficiently shows the distinction between the two species.

The figure of *R. sumatrensis* ♀, Blainv. Ostéog. t. ii., is not so high behind as the skulls of either of the species, and in other respects is not characteristic.

Ceratorhinus niger. Plate XI. (skull).

The British Museum purchased from the Zoological Society the body of the *Rhinoceros* which was obtained by Mr. William Jamrach at Singapore, and which was captured at Malacca in 1871. It is peculiar for having a very rough skin, the body being covered with thick black hair; the tail is comparatively long and thin; and the ears are closer together than in *C. sumatranus*.

Mr. Edward Gerrard, Jun., has preserved and stuffed the skin, and prepared a very complete skeleton of the animal.

The skull is very different from those of the Sumatran Rhinoceros (*R. sumatranus*, Raffles), collected by Sir Stamford Raffles and now in the British Museum and in that of the Royal College of Surgeons, and from the skull which we purchased of Mr. Theobald, and proves most distinctly that I was right in stating the animal, when alive, to be very distinct from the Sumatran Rhinoceros described and figured by Bell in the 'Philosophical Transactions' for 1793, to which Sir Stamford Raffles gave the name of *R. sumatranus*, under which name the Malaccan Rhinoceros was exhibited at the Zoological Gardens and mentioned in the list of accessions in the 'Proceedings of the Zoological Society;' and I see by the report that a paper on the details of its visceral anatomy has been read to the Society by Mr. Garrod.

There has for many years existed in the British Museum a stuffed skin of a young specimen of this species, which was purchased of Mr. Franks of Amsterdam as the young Sumatran Rhinoceros; but there is reason to believe that this specimen was from Singapore, the port of Malacca.

The skull of the Malaccan Rhinoceros is very like that of the Sumatran one; but it is shorter and broader than that of *R. sumatranus*. The hole in the cheek for the passage of the large vessels is oblong, much larger, and nearer the margin of the nasal aperture; while in the two skulls of *R. sumatranus* it is smaller, circular, and some distance from the margin of the aperture. The front edge of the intermaxillary bones is broader, rounded, and not compressed or nearly so much produced as the front edge of the intermaxillary bone of the adult skull of *R. sumatranus*, nor so much as in the skull of the young animal of the same species, which is shorter and broader than in the adult. The grinders of the upper jaw are six in number, and appear broader than those of the adult *R. sumatranus*, but they occupy the same length.

The skull of the Malaccan Rhinoceros is not so high behind as that of the adult Sumatran Rhinoceros; and the space in the crown between the temporal muscles is flat, and much wider than that of the adult but not so aged Sumatran Rhinoceros in the British Museum. The back end of the upper part of the occiput is not nearly so broad as that of the Sumatran Rhinoceros.

The most striking difference is in the lower jaw. The condyles are further apart; indeed the whole jaw is wider; but the outer edge of the hinder angle is much more expanded. This latter peculiarity, as well as the form of the crown of the grinders in the upper jaw, may arise from the greater age of the specimen. The greatest peculiarity is that the front of the

lower jaw is comparatively thin, expanded, and has neither teeth nor alveoli, nor, indeed, one may say, sufficient thickness to hold the large cutting-teeth usually found in the front of the lower jaw of this genus. The grinders are six on each side; that is to say, the front tooth on each side is retained, whereas it is shed from the skull of the adult but much less aged animal of *C. sumatranus* in the British Museum; and the grinders appear to differ in the form of their folds from those of the Sumatran species.

	<i>C. niger.</i>	<i>C. sumatranus.</i>
	in.	in.
Length from tip of nose to occipital condyle of adult	21½	22
From front of intermaxillary to occipital condyle	20¼	21
From front edge to back edge of lower jaw .	16½	17
Width at zygomatic arch	12	11
Width of hinder end of lower jaw	10⅔	9½
Width of upper part of lower jaw at end of tooth-line.....	7½	6¾
Height of back of skull	13	13½

It is very probable that the want of front teeth in the lower jaw may be an individual peculiarity produced by the age of the specimen; at least I do not think it safe to regard that peculiarity as specific without an examination of more specimens.

Ceratorhinus Crossii.

In the 'Annals and Magazine of Natural History,' 1872, x. p. 209, I referred to this species and thought it might be the same as *R. sumatranus* from Tavoy and Tenasserim, mentioned by Blyth, Journ. Asiat. Soc. Bengal, 1862, p. 156, who figures the skull and horns, and who identifies his animal with my *R. Crossii* (which was described from a pair of horns, P. Z. S. 1854), and has just informed me that he is certain that it is the head of the small black rhinoceros with two horns.

It is most likely that he is correct in thinking that the horn I figured as *R. Crossii* is of the same species as the skulls which he received from Tenasserim; but it is to be observed that I have never seen a skull of the Tenasserim Rhinoceros, and do not know whether it is the same as *C. sumatranus* from Sumatra or *C. niger* from Malacca, or whether it may be a distinct species. Therefore I think it best, until we receive skulls of the Tenasserim species, to give the Malaccan one a distinct name and call it *C. niger* (as the black colour at once distinguishes it from the greyish Sumatran species), more es-

pecially as some zoologists who admit the difference of the two species refer *R. Crossii*, of which we know nothing but the horn, to each of the species.

Ceratorhinus Blythii.

Mr. Blyth, in the 'Journal of the Asiatic Society of Bengal,' vol. xxxi. t. iii. f. 1, 2, 3, lithographs from photographs (which he has since given to me) three skulls of what he calls *R. sumatranus* from Tenasserim.

These skulls, according to the photographs, differ so much from each other that they do not afford materials for the determination of the question of the species to which the Tenasserim Rhinoceros should be referred.

The photographs represent the skulls of animals of very different ages; but I cannot believe the difference between them depends solely on age, as the skull of the oldest (fig. 1) and of the youngest (fig. 3) agree in the shape of the occiput and in the upper surface not being produced behind, while the skull of the half-grown one (fig. 2) has the upper surface of the occiput very much produced backwards, and the occipital condyles not so prominent.

The three photographs are nearly of the same breadth at the lateral condyles; but the length of the upper surface of the skull differs considerably as compared with its breadth. Thus in the photograph of the aged specimen (t. iii. f. 1) the length of the skull is once and three-fourths its breadth; in the youngest skull (t. iii. f. 3) it is very nearly of the same proportion; but in the nearly adult skull the photograph represents the upper surface as a little more than twice as long as the breadth at the condyles.

The most striking difference is in the height of the occipital end and the form of the lower jaw in the photographs of the adult and nearly adult skulls (f. 1 & 2).

In the adult skull the occipital end is high (that is, as high as two thirds the length of the skull from the occipital condyle to the end of the nose), and the hinder end of the lower jaw is nearly erect, with a broad rounded lower part, which is prominent, with diverging ridges on its outer margin. In the nearly adult specimen the hinder end is not nearly so high compared with the length, and the hinder end of the lower jaw shelves off towards its lower edge and has not the expanded rounded form of the lower jaw of the other specimen; but it is curious that the skull of the youngest one has the form of the occiput of the very aged one and the form of the lower jaw of the middle-aged one. All this shows the difficulty of distinguishing the species of these animals and the necessity of waiting until

we get together more specimens and their skulls from different parts of Asia. It may turn out that more than one species of two-horned Rhinoceros inhabit Tenasserim. There is a one-horned one, *R. javanicus*, also found there. The photograph of the oldest skull (t. iii. f. 1) and the youngest (t. iii. f. 3) agree in many particulars with our skulls of *C. sumatranus* from Sumatra—that is to say, in the width of the skull at the lateral condyles and in the narrowness of the space that separates the temporal muscles of the adult; but the surface of the lower jaw of the adult specimen most resembles that of *C. niger*. The latter fact may depend solely upon the age of the specimen.

Mr. Blyth informs me that he believes the adult skull (t. iii. f. 1) is the skull of *R. Crossii*, which he thinks is *R. lasiotis*, and he believes that the two younger skulls (t. iii. f. 2 & 3) belong to the black Rhinoceros. The youngest skull (t. iii. f. 3) has the skin of the head and horns attached to it in the Museum at Calcutta. But the lower jaw in the two younger specimens does not agree in form with the lower jaw of *C. niger*; and therefore I should provisionally name them *C. Blythii*.

The African Rhinoceroses have the intermaxillary bones small, laminar, situated on the front end of a bony plate separated by a suture (which becomes obliterated in the older specimens) in the inner side of the front part of the maxillæ; and it has a tooth on the edge, which generally falls out in the adult animal; hence they are usually described as having no intermaxillary cutting-teeth. The lower jaw of the young *R. bicornis* (1365 *b*) has a small cylindrical cutting-tooth on each side of the broad end of the jaw, which disappears in the older animals; and the breadth of the front of the jaw does not increase, and therefore becomes smaller compared with the size of the skull. In the skull of the foetal specimen of *R. bicornis*, 8½ in. long (1365 *h*), with the three grinders but partially developed, the intermaxillaries are cartilaginous, and show rudiments or, rather, nuclei of two teeth.

The lamina on the inside of the maxillæ of these African Rhinoceroses, bearing the intermaxillaries, is represented in the Asiatic Rhinoceroses by a broad portion of the inside of the maxillæ, which is marked by an external groove; but in these animals the broad intermaxilla is attached to the end of the maxilla, as well as to the end of this defined part.

EXPLANATION OF PLATE XI.

The skull of the two-horned Rhinoceros (*Ceratorhinus niger*) from Malacca; and a view of its occipital extremity, showing the form and breadth of the hinder part of the head.